

United States  
Environmental Protection  
Agency

Office of Emergency and  
Remedial Response  
Washington, DC 20460

9355.0-04B  
PB95-963307  
EPA 540/R-95/059  
June 1995

---



# Remedial Design/Remedial Action Handbook



Printed on Recycled Paper

### **Disclaimer**

The policies and procedures set forth here are intended as guidance to Agency and other Government employees. They do not constitute rulemaking by the Agency and may not be relied on to create a substantive or procedural right enforceable by any other person. The Government may take action that is at variance with the policies and procedures in this manual.

### **Additional Copies**

Additional copies of this report may be obtained from the following source:

National Technical Information Service (NTIS)  
U.S. Department of Commerce  
5285 Port Royal Road  
Springfield, VA 22161  
(703) 487-4650

## **Acknowledgements**

---

This handbook is the product of the U.S. Environmental Protection Agency's (EPA's) Office of Emergency and Remedial Response (OERR). The EPA Work Assignment Manager was Richard Jeng of the Hazardous Site Control Division (HSCD), Design and Construction Management Branch (DCMB). Lieutenant Commander Jo Ann Griffith, U.S. Public Health Service, was the original author.

Special recognition is extended to the following co-authors for their ongoing support, essential technical expertise, and invaluable recommendations and insight:

Kenneth J. Erickson, P.E., USEPA, Region IX  
Jo Ann Cola, USEPA, Region IX  
Frances Costanzi, USEPA, Region III  
Gene Wingert, USEPA, Region III  
William J. Bolen, USEPA, Region V  
Kenneth Skahn, P.E., USEPA, HQ HSCD/DCMB  
Robert Curnyn, P.E., U.S. Army Corps of Engineers

The authors express their appreciation to the following persons for their contributions to the depth of information embodied in the handbook: Tracy Hopkins, P.E., USEPA, HQ HSCD/DCMB, and Gary L. Johnson, USEPA, QAD/RTP-NC.

# Table of Contents

## Chapter 1 Introduction

1.1 Purpose of the Handbook .....	1
1.2 Overview of the Handbook .....	1

## Chapter 2 Project Management

2.1 Introduction .....	3
2.2 Definition of Project Management .....	3
2.2.1 Scope of Work .....	3
2.2.2 Project Budget, Funding, and Costs .....	3
2.2.3 RD/RA Schedule .....	3
2.2.4 Project Team .....	3
2.3 Skills of a Successful Project Manager .....	4
2.3.1 Knowledge of Project Management Principles .....	4
2.3.2 Competency as a Manager in a Project Environment .....	4
2.3.3 Leadership .....	4
2.3.4 Technical Competence .....	4
2.4 Project Management .....	4
2.4.1 Monitoring the RD/RA .....	4
2.4.2 Managing the RD/RA .....	5
2.5 General RPM Responsibilities During RD/RA .....	6
2.5.1 Responsibilities During RD/RA Planning .....	7
2.5.2 Responsibilities During RD/RA Execution .....	8
2.5.3 Responsibilities During RD/RA Closeout .....	8
2.5.4 Limits of Authority .....	8
2.5.5 Potential RPM Liability .....	9

## Chapter 3 RD/RA Project Planning

3.1 Introduction .....	11
3.2 Developing the Project Management Plan .....	11
3.3 Establishing the RD/RA Lead for Federal-Lead Projects .....	12
3.4 Assembling a Technical Review Team .....	12
3.5 Developing a Communications Strategy .....	14

<b>3.6</b>	<b>Collecting Predesign Information</b> .....	14
<b>3.7</b>	<b>Analyzing Project Constraints</b> .....	15
3.7.1	General Constraints .....	16
3.7.2	Property Access Issues .....	18
3.7.3	Record of Decision Changes .....	19
<b>3.8</b>	<b>Scheduling the RD/RA</b> .....	20
3.8.1	Gantt Chart Method .....	20
3.8.2	Critical Path Method .....	21
<b>3.9</b>	<b>Developing the RD/RA Budget</b> .....	21
<b>3.10</b>	<b>Developing a Contracting Strategy for the RD and RA</b> .....	22
3.10.1	Schedule Acceleration .....	23
3.10.2	RD/RA Design Approach .....	24
3.10.3	RA Contracts .....	25
3.10.4	RA Procurement Strategies .....	26
<b>3.11</b>	<b>Coordinating with the State</b> .....	27
3.11.1	State Support Role in Federal-Lead RD/RA .....	27
3.11.2	Developing the Superfund State Contract .....	27
<b>3.12</b>	<b>Maximizing Community Relations</b> .....	28

**Chapter 4 Federal-Lead Remedial Design**

<b>4.1</b>	<b>Introduction</b> .....	31
<b>4.2</b>	<b>Deciding to Task the RD to an EPA Contractor or USACE</b> .....	31
<b>4.3</b>	<b>Developing the Statement Of Work</b> .....	31
4.3.1	Preparing the Remedial Design Statement of Work .....	33
4.3.2	Developing a Preliminary Remedial Design Schedule .....	35
4.3.3	Developing the Remedial Design Independent Government Cost Estimate .....	36
<b>4.4</b>	<b>Tasking the Remedial Design</b> .....	36
4.4.1	Tasking the Remedial Design to an EPA Contractor .....	37
4.4.2	Tasking the Remedial Design to USACE .....	38
4.4.3	Managing the Progress of the Remedial Design .....	40
<b>4.5</b>	<b>Procuring a USACE Designer</b> .....	42
<b>4.6</b>	<b>Reviewing and Approving the Work Plan (ARCS/RACs)</b> .....	43
4.6.1	Reviewing the Work Plan .....	43
4.6.2	Negotiating with the Contractor .....	44
4.6.3	Approving the Work Plan .....	45

<b>4.7</b>	<b>Overseeing the Design Development</b> .....	45
4.7.1	Design Review Procedures .....	45
4.7.2	Predesign Phase Submittals .....	46
4.7.3	Treatability Studies .....	50
4.7.4	Preliminary Design Phase .....	51
4.7.5	Intermediate Design Phase .....	55
4.7.6	Prefinal/Final Design .....	58
<b>4.8</b>	<b>Value Engineering During Remedial Design</b> .....	61
4.8.1	VE Screen .....	61
4.8.2	VE Study Team .....	61
4.8.3	VE Study .....	62
<b>4.9</b>	<b>Post-Design Activities</b> .....	63

## **Chapter 5 Federal-Lead Remedial Action**

<b>5.1</b>	<b>Introduction</b> .....	65
5.1.1	Preparation for the Remedial Action .....	65
5.1.2	Responsibilities of Key Participants Involved In the Remedial Action .....	65
<b>5.2</b>	<b>Remedial Action Planning Activities</b> .....	67
5.2.1	Revising the Project Management Plan .....	68
5.2.2	Assembling the Technical Review Team .....	68
5.2.3	Finalizing the Superfund State Contract and Defining State Involvement During the Remedial Action ....	68
5.2.4	Developing the Remedial Action Statement of Work .....	69
5.2.5	Developing the IGCE .....	70
5.2.6	Developing the Remedial Action Schedule .....	71
5.2.7	Issuing the RA Work Assignment or Executing the Interagency Agreement .....	71
<b>5.3</b>	<b>Managing the Remedial Action</b> .....	71
5.3.1	Managing the RA Work Assignment or Terms of the Interagency Agreement .....	71
5.3.2	Community Relations During the Remedial Action .....	72
5.3.3	Reviewing the EPA Contractor's Remedial Action Work Plan .....	72
<b>5.4</b>	<b>The Remedial Action Procurement Process</b> .....	73
5.4.1	Sealed Bidding .....	73
5.4.2	Negotiated Procurement .....	74
5.4.3	Two-Step Sealed Bidding .....	74
5.4.4	Non-Competitive (Sole-Source) Procurement .....	75
5.4.5	The Remedial Project Manager's Role in the Procurement Process .....	75

5.4.6	Approving the EPA Contractor's Selected Constructor .....	75
5.4.7	Construction Contract Award Controversies .....	75
<b>5.5</b>	<b>Preconstruction Activities .....</b>	<b>76</b>
5.5.1	Issuing the Notice to Proceed .....	76
5.5.2	Conducting the Preconstruction Conference .....	76
5.5.3	Delivering the Preconstruction Submittals .....	77
5.5.4	Providing Site Security .....	77
5.5.5	Mobilizing the Constructor .....	77
5.5.6	Posting EPA Signs at the Site .....	77
<b>5.6</b>	<b>Construction Implementation .....</b>	<b>77</b>
5.6.1	Inspection and Testing .....	78
5.6.2	Monitoring Construction Progress .....	78
5.6.3	Reviewing Record Drawings .....	80
5.6.4	Changes to the Construction Contract .....	80
5.6.5	Managing Claims .....	81
5.6.6	Value Engineering During Construction .....	81
<b>5.7</b>	<b>Contractor Completion Activities .....</b>	<b>82</b>
5.7.1	Achieving an Operational and Functional Remedy .....	82
5.7.2	Prefinal Construction Conference .....	82
5.7.3	Prefinal and Final Inspections .....	82
5.7.4	Contractual Acceptance of the Project and Warranty .....	83
5.7.5	Remedial Action Report .....	84
<b>5.8</b>	<b>State Operation and Maintenance .....</b>	<b>84</b>
<b>5.9</b>	<b>Site Closeout Process .....</b>	<b>85</b>
5.9.1	Construction Completion Activities .....	85
5.9.2	Site Completion Activities .....	87
5.9.3	Site Deletion Activities .....	89
<b>Appendix A Glossary .....</b>		<b>A-1</b>
<b>Appendix B Transmittal Forms .....</b>		<b>B-1</b>
<b>Appendix C Design Review Checklists .....</b>		<b>C-1</b>
<b>Appendix D Model RD, RA, and Technical Assistance IAGs .....</b>		<b>D-1</b>

<b>Appendix E Model RD, RD Oversight, RA, and RA Oversight SOWs .....</b>	<b>E-1</b>
<b>Appendix F RD/RA Fact Sheets and Other Guidance .....</b>	<b>F-1</b>
<b>Appendix G State-Lead .....</b>	<b>G-1</b>
<b>Appendix H Enforcement-Lead .....</b>	<b>H-1</b>
<b>Appendix I Operations and Maintenance .....</b>	<b>I-1</b>

**List of Figures**

Figure 2-1. Skills of a Successful Project Manager .....	4
Figure 2-2. Remedial Project Management Responsibilities .....	7
Figure 3-1. Project Management Plan .....	11
Figure 3-2. Potential Technical Review Team Members .....	13
Figure 3-3. Example of a Communications Matrix .....	15
Figure 3-4. Typical Collection of Pre-design Information .....	15
Figure 3-5. Examples of ROD Changes .....	19
Figure 3-6. Gantt Chart .....	21
Figure 3-7. Gantt Chart with Critical Path Identified .....	22
Figure 3-8. Construction Bond Requirements .....	26
Figure 4-1. RPM Responsibilities During Remedial Design .....	32
Figure 4-2. EPA Contractor RD Standard Tasks (RACs) .....	33
Figure 4-3. USACE Standard Design Specifications .....	34
Figure 4-4. Principal Remediation Categories for RD Schedules .....	36
Figure 4-5. Components of a Work Plan .....	43
Figure 4-6. Components of the HASP .....	47
Figure 4-7. Field Sampling Plan Contents .....	48
Figure 4-8. Suggested Format for the QAPP .....	49
Figure 4-9. Suggested Format for a Pilot-Scale Treatability Study .....	50
Figure 4-10. Preliminary Design Phase Submittal Components .....	52
Figure 4-11. Intermediate Design Phase Submittal Components .....	55
Figure 4-12. Prefinal/Final Design Phase Submittal Components .....	58
Figure 4-13. Value Engineering Screening .....	62
Figure 5-1. Preremedial Action Checklist .....	65

Figure 5-2. Remedial Action Process .....	66
Figure 5-3. Contractual Relationships in the Remedial Action Process .....	67
Figure 5-4. Roles and Responsibilities of the Resident Engineer .....	68
Figure 5-5. RAC and ARCS Contract RA Standard Tasks .....	69
Figure 5-6. Preconstruction Conference Activities .....	77
Figure 5-7. EPA Contractor Progress Reports .....	79
Figure 5-8. Site Completion and Deletion Processes .....	86
Figure 5-9. Contents of the Preliminary Closeout Report .....	87
Figure 5-10. Final Closeout Report Summary .....	88
Figure 5-11. Contents of the Notice of Intent to Delete .....	90

## Acronyms and Abbreviations

---

### A, B

---

<b>A/E</b>	Architect/Engineer
<b>ARARs</b>	Applicable or Relevant and Appropriate Requirements
<b>ARCS</b>	Alternative Remedial Contracting Strategy
<b>BAFO</b>	Best and Final Offer

### C

---

<b>CA</b>	Cooperative Agreement
<b>CBD</b>	<i>Commerce Business Daily</i>
<b>CCE</b>	Construction Cost Estimate
<b>CD</b>	Consent Decree
<b>CERCLA</b>	Comprehensive Environmental Response, Compensation, and Liability Act
<b>CERCLIS</b>	CERCLA Information System
<b>CFR</b>	<i>Code of Federal Regulations</i>
<b>CM</b>	Construction Manager
<b>CO</b>	Contracting Officer
<b>CPAF</b>	Cost-Plus-Award-Fee
<b>CPM</b>	Critical Path Method
<b>CQAP</b>	Construction Quality Assurance Plan
<b>CRC</b>	Community Relations Coordinator
<b>CRP</b>	Community Relations Plan
<b>CSI</b>	Construction Specification Institute
<b>CWE</b>	Current Working Estimate

### D

---

<b>D&amp;CA</b>	Design and Construction Advisor
<b>D&amp;F</b>	Determination and Finding
<b>DBA</b>	Davis-Bacon Act
<b>DQO</b>	Data Quality Objective

**E**

---

<b>EL</b>	Expenditure Limit
<b>EPCRA</b>	Emergency Planning and Community Right-to-Know Act
<b>ERP</b>	Emergency Response Plan
<b>ESD</b>	Explanation of Significant Differences

**F**

---

<b>FAR</b>	<i>Federal Acquisition Regulation</i>
<b>FCOR</b>	Final Closeout Report
<b>FR</b>	<i>Federal Register</i>
<b>FRP</b>	Federal Response Plan
<b>FS</b>	Feasibility Study
<b>FSP</b>	Field Sampling Plan
<b>FY</b>	Fiscal Year

**G, H**

---

<b>GAO</b>	General Accounting Office
<b>HASP</b>	Health and Safety Plan
<b>HTRW</b>	Hazardous, Toxic, and Radioactive Waste

**I**

---

<b>IAG</b>	Interagency Agreement
<b>IDT</b>	Indefinite Delivery
<b>IFB</b>	Invitation for Bids
<b>IGCE</b>	Independent Government Cost Estimate

**L**

---

<b>LAN</b>	Local Area Network
<b>LEPC</b>	Local Emergency Planning Committee
<b>LOE</b>	Level-of-Effort

**LTCS** Long-Term Contracting Strategy  
**LTRA** Long-Term Response Action

**M**

---

**MOU** Memorandum of Understanding  
**MSW** Municipal Solid Waste

**N**

---

**NCP** National Contingency Plan  
**NOID** Notice of Intent to Delete  
**NPL** National Priorities List  
**NRC** National Response Center  
**NTCRA** Non-Time-Critical Removal Action

**O**

---

**O&M** Operations and Maintenance  
**OERR** Office of Emergency and Remedial Response  
**OGC** Office of General Counsel  
**OIG** Office of Inspector General  
**OMB** Office of Management and Budget  
**ORC** Office of Regional Counsel  
**ORD** Office of Research and Development  
**OSC** On-Scene Coordinator  
**OSHA** Occupational Safety and Health Administration  
**OSWER** Office of Solid Waste and Emergency Response  
**OU** Operable Unit

**P**

---

**P&ID** Piping and Instrumentation Diagram  
**PCOR** Preliminary Closeout Report  
**PFD** Process Flow Diagram

<b>PPE</b>	Personal Protective Equipment
<b>PO</b>	Project Officer
<b>PR</b>	Procurement Request
<b>PRP</b>	Potentially Responsible Party

**Q**

---

<b>QA</b>	Quality Assurance
<b>QAPP</b>	Quality Assurance Project Plan
<b>QC</b>	Quality Control

**R**

---

<b>RA</b>	Remedial Action
<b>RAC</b>	Response Action Contract
<b>RACS</b>	Response Action Contracting Strategy
<b>RCRA</b>	Resource Conservation and Recovery Act
<b>RD</b>	Remedial Design
<b>RE</b>	Resident Engineer
<b>REPR</b>	Real Estate Planning Report
<b>RFP</b>	Request for Proposal
<b>RI</b>	Remedial Investigation
<b>ROC</b>	Regional Off-Site Contract
<b>ROD</b>	Record of Decision
<b>RPM</b>	Remedial Project Manager

**S**

---

<b>S/RPOD</b>	Superfund/RCRA Procurement Operations Division
<b>SACM</b>	Superfund Accelerated Clean-Up Model
<b>SAP</b>	Sampling and Analysis Plan
<b>SARA</b>	Superfund Amendments and Reauthorization Act
<b>SAVE</b>	Society of American Value Engineers
<b>SCA</b>	Service Contract Act
<b>SF</b>	Standard Form
<b>SMOA</b>	State Memorandum of Agreement

**SMP** Site Management Plan  
**SOP** Standard Operating Procedure  
**SOW** Statement of Work  
**SSC** Superfund State Contract

**T**

---

**TA** Technical Assistance  
**TAG** Technical Assistance Grant  
**TD** Technical Direction  
**TERC** Total Environmental Restoration Contract  
**TQM** Total Quality Management  
**TRT** Technical Review Team

**U**

---

**UAO** Unilateral Administrative Order  
**USACE** United States Army Corps of Engineers

**V**

---

**VE** Value Engineering  
**VECP** Value Engineering Change Proposal  
**VEP** Value Engineering Proposal

**W, X, Y, Z**

---

**WA** Work Assignment  
**WACN** Work Assignment Closeout Notification  
**WACR** Work Assignment Completion Report  
**WAF** Work Assignment Form  
**WAM** Work Assignment Manager  
**WAP** Work Assignment Package  
**WBS** Work Breakdown Structure  
**WP** Work Plan